



## **User Instructions 800, 1000, 1500 and 2500 Watt Power Inverters**

**Models SPV-8, SPV-10, SPV-15 and SPV-25**



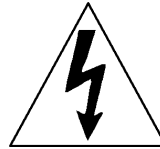
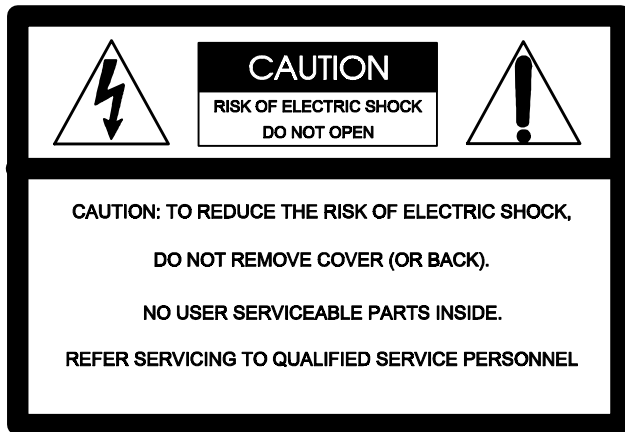
## Safety Information

### IMPORTANT

Read all the Cautions and Warnings before installing and using the power inverter. The inverter must be properly installed. If you are not familiar with 12 volt high current wiring, it is recommended that you have a professional automotive installer install the inverter.

### WARNING

**To prevent fire or shock hazard, do not expose the unit to rain or moisture**



This symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

### CAUTION

**The power inverter generates 115 VAC power from your 12 volt car battery. Treat the 115 VAC output just like you treat the 115 VAC in your house. It is just as dangerous.**

Do not connect the unit to AC distribution wiring, such as your house wiring.

Keep the unit away from water. Do not allow water to drip or splash onto the power inverter.

Keep the unit in cool environments. Ambient air temperature should be between 32° and 75° F. Keep out of direct sunlight and away from heating vents.

Keep the unit away from flammable material or in any location which may accumulate flammable fumes or gases, such as the battery compartment of your car, boat, RV or truck.

With heavy use, the unit will become warm and possibly hot. So, keep it away from any heat sensitive materials.

Make sure the opening to the fan and vent holes are not blocked.

Do not open the unit. High voltages are inside.

Use proper size wiring. High power inverters can draw many amps from the 12v source and can melt wires if not fused and sized properly.

### IMPORTANT

**Sima Products does not authorize any products to be used in life support devices or systems without the express written approval of the President of Sima Products Corp.**

Model No. \_\_\_\_\_  
Date Purchased \_\_\_\_\_

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## Introduction

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Congratulations on your purchase of a Sima power inverter. It provides 115 VAC anywhere you have 12 volts DC in your car, truck, RV or boat. It is designed to be easy to use and to provide years of dependable service.

## Key Features

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High-efficiency operation to provide the most output with the least battery power usage.

### **Advanced protection**

- Thermal Protection shuts the unit off to guard against the unit getting too hot
- Overload Protection protects the unit from excessive loads
- Under Voltage Protection turns the unit off to protect the battery from being over discharged

The Sima power inverter produces a modified sine wave output which is suitable for most AC loads. This includes lights, appliances, motors, TVs and most electronics.

**CAUTION:** There are a few battery chargers that are not compatible with modified sine wave operation. These are typically small rechargeable, battery operated devices like razors and flashlights that can be plugged directly into an AC receptacle to recharge. Some chargers for battery packs used in power tools also should not be used with an inverter. These chargers typically have a warning label indicating that dangerous voltages are present at the battery terminals. Only a true sine wave inverter should be used with these types of appliances. Damage to the device could result if you attempt to use them with any type of modified sine wave inverter.

**Do not use the Sima power inverter with the above devices.**

## Package Includes

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Inverter (SPV-8, SPV-10, SPV-15 or SPV-25)  
5' Cables with Alligator clips (except SPV-25)  
This manual

## Needed for Installation (not included)

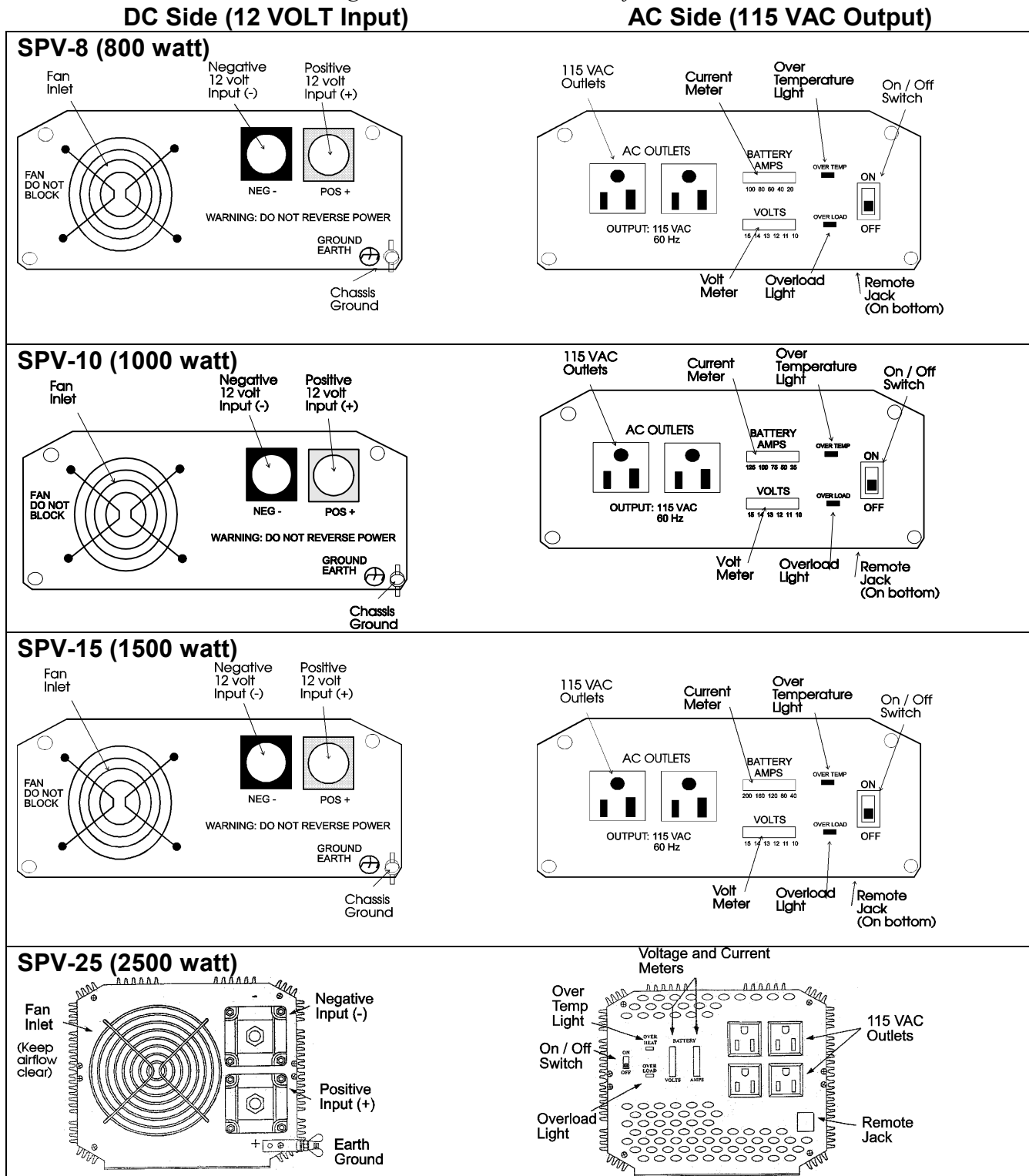
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Mounting hardware for the inverter  
12 volt dc power wiring, fuse block and connectors  
Tools

## Overview of the Power Inverter

The Sima power inverter is an electronic device that converts the low voltage 12 volt from a battery or other power source to 115 VAC to run standard household appliances. (See the section on How it Works to learn more about the technology used in the Sima power inverter.)

Figure #1, DC and AC sides of Inverters



## Installation

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### Installation Overview

There are three basic steps you need to follow when installing the power inverter.

- 1) Mounting: Mount the inverter securely
- 2) Wiring: Wire the inverter to a 12 volt source
- 3) Testing: Test for proper operation

### Step #1: Mounting the Inverter

The power inverter should be secured to a solid flat surface capable of handling the weight of the unit. It is very important that the unit be secured using the proper sized mounting hardware (not included) to keep the unit from moving around or becoming loose in emergency situations.

The power inverter should be placed with space around the unit for proper ventilation. Do not block the air entrance to the fan or block the exhaust holes located on the side or bottom of the unit.

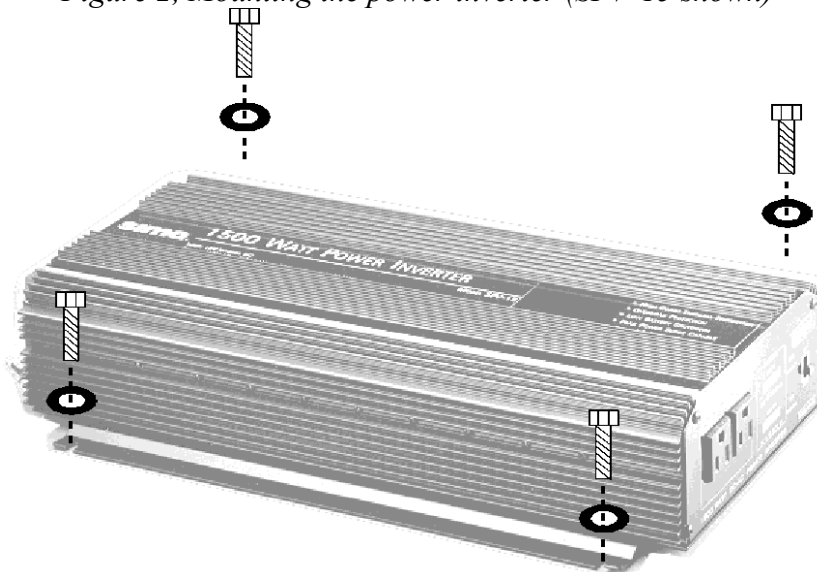
The unit must be mounted in a dry, cool area. Do not allow water to drip or splash onto the inverter. The ambient air temperature should be between 32° F and 75° F.

The unit must not be mounted in an area with batteries or in any area capable of storing flammable liquids such as gasoline.

To minimize cable lengths, the unit should be mounted as close as possible to the battery, but not in the same compartment. If you have a choice, it is better to run longer AC wires than DC cables.

**CAUTION: The power inverter must be mounted securely in any type of moving vehicle. In an emergency situation, if the power inverter is not securely mounted, it could cause bodily injury**

*Figure 2, Mounting the power inverter (SPV-15 shown)*



## Step #2: Wiring Inverter to 12 Volt Power

The power inverter requires connection to a standard 12 volt DC power source as found in most cars, trucks, RVs and boats. The power source must provide between 11 and 15 volts DC. The power source must be able to provide sufficient current to power the load. See the chart below that shows minimal wire sizing and current draw at full load.

*Wire Size Chart*

Inverter Model	Current at rated power	Suggested User Installed 12v Fuse Size	Suggested Wire gauge, less than-10'	Suggested Wire gauge, 10' to 25'
SPV-8	75 Amps	80 A	4 AWG	2 AWG
SPV-10	94 Amps	100A	2 AWG or two 6 AWG	0 AWG or two 4 AWG
SPV-15	140 Amps	150 A	2 AWG or two 6 AWG	1/0 AWG or two 2 AWG
SPV-25	235 Amps	250 A	2/0 AWG or two 1 AWG	4/0 AWG or two 2/0 AWG

Always connect the positive, red (+) terminal to the positive connection and the negative, black (-) terminal to the negative or ground side of the power system.

### **WARNING**

**Failure to connect the correct polarity may cause damage to the power inverter and/or your electrical system and is not covered by the warranty.**

## Temporary Wiring

The power inverter (except the SPV-25 because of the high current draw) comes with a set of jumper cables to attach directly to your battery terminals for temporary usage. For permanent installation, you should hardwire the power inverter into your 12 volt system as described below.

### **WARNING**

**When connecting cables, a spark may occur. This is normal. To prevent explosion from the battery gasses, when connecting jumper cables, always connect the wires to the inverter first, then connect the positive alligator clip to the positive (+) terminal on the battery. Finally connect the negative (-) alligator clip to a solid ground point on the engine.**

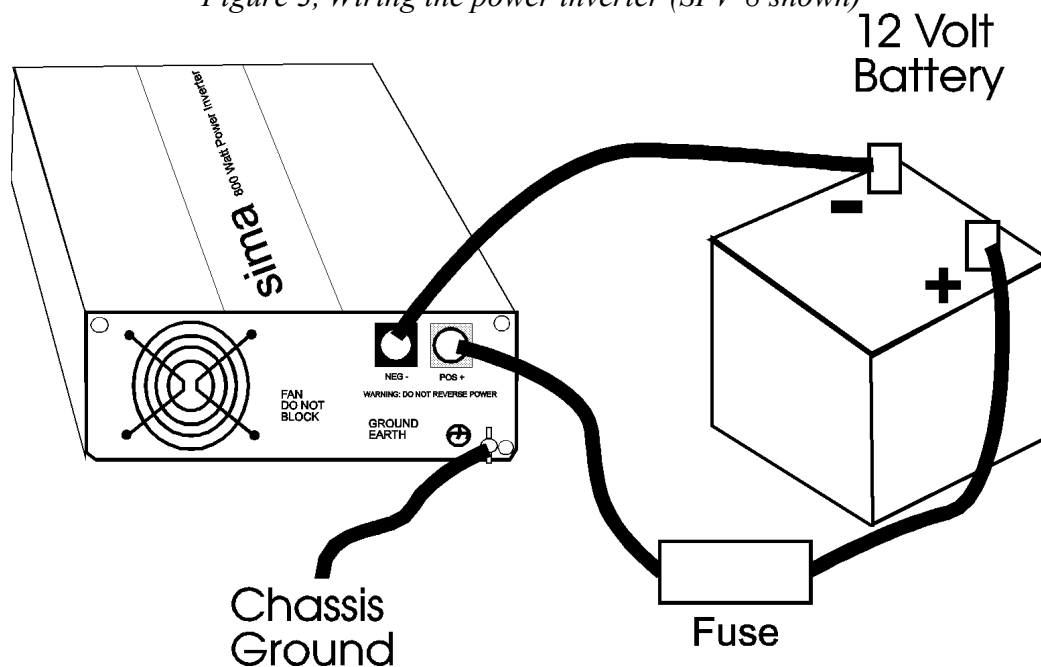
Connect the red wire to the red positive (+) terminal on the inverter and the black wire to the black negative (-) terminal on the inverter. Connect the red alligator clip to the positive battery terminal and the black alligator to the frame or engine of the vehicle. Follow the instructions below and proceed to Step #3 Testing the Power Inverter.

### INSTALLATION TIP

To minimize electrical interference, keep the DC power cables as short as possible and twist them with 1 to 3 twists per foot. This minimizes radiated interference from the cables.

### Permanent Installation

Figure 3, Wiring the power inverter (SPV-8 shown)



**CAUTION:** Always use adequate wire size and fusing for any installation

### Wiring Steps

- Disconnect the positive battery terminal before doing any wiring to the inverter.
- Using proper sized copper wire and proper terminations, wire the inverter to the electrical system and fuse block. See your local RV dealer or automotive shop for wire, connectors, fuse block and other wiring parts. Tighten all connections firmly, but do not over tighten. Remember to recheck all connections every few months of operation.

**SPV-8, SPV-10 and SPV-15** - Strip ½" of insulation off of the wire and insert into the terminal on the inverter. Do not tin the wire. Tighten the set screw securely using a proper size screwdriver.

**SPV-25** - Use ring type lugs for a 5/16" post to attach to the wires. Crimp the lugs to the wire and slide the lugs under the nut and tighten securely.



- Connect the GROUND terminal to earth or chassis ground using at least a # 8 wire. It is recommended to crimp a ring type terminal to the ground wire and attach it to the ground lug.

**WARNING**

**Do not operate the inverter without the ground connection. Electrical shock hazard could result.**

- Double check all wiring for proper polarity and there are no frayed wires.
- Install the fuse and reconnect the wire to the battery. Note, a slight spark and beep from the inverter is normal when the unit is first connected to 12 volt power.

**Advanced Installation**

Large inverters can draw high currents from your battery and charging system especially when used with appliances and tools that use a lot of power. In these applications, you may need to increase the capacity of your 12 volt system. There are several ways to do this.

**High Capacity Batteries**

You can purchase high capacity batteries that are specially designed for deep discharge operation. Contact your automotive or RV specialist for more information.

**Multiple Batteries**

In systems with multiple batteries, you typically wire the system with the batteries in parallel (negative to negative and positive to positive) with a battery isolator between the positive terminals. The isolator allows a single alternator to charge both batteries but lets the inverter only use the second battery so the vehicle's battery is not discharged during operation. Contact your automotive or RV specialist for more information about battery isolators and wiring.

**Larger Alternator**

Typical automotive alternators may not be able to supply the power required for continuous operation of the inverter at high power usage. Contact your automotive or RV specialist for more information about larger output alternators.

**Remote On/Off Jack**

The SPV-8, SPV-10, SPV-15 and SPV-25 contain a jack which interfaces with an optional remote on/off switch. Contact Sima for additional information.

**CAUTION: Do not plug a telephone into this jack as damage or improper operation may occur.**

**Step #3: Testing the Power Inverter**

After you make sure the 12 volt power is wired properly to the power inverter, with nothing plugged into the 115 VAC outlets, turn the power switch on the power inverter to On. The VOLTAGE meter should indicate between 12 and 14 volts.

If the inverter does indicate proper voltage, turn the power switch off and check your wiring and external fuse.

With the inverter turned off, plug the appliance you want to use into the 115 VAC power outlet on the unit. Turn the power switch on the power inverter on so the VOLTAGE meter indicates between 12 and 14 volts. Turn on the appliance. The appliance should now be operational.

Check the Troubleshooting section if you have any difficulties.

## Operation

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### **Equipment Power Usage**

It is important to use only products that draw less than the power rating of the power inverter. Use of products greater than the rated power rating may either cause the protection circuitry of the power inverter to shut down or the fuse to blow. Repeated use of excessive power draw can cause failure of the power inverter.

How to calculate power usage. Most products have a power rating on them such as 45 watts. Others may be marked with their current draw, such as .9 amps. To convert the current to watts multiply the current by 115. (Example: .9 amps x 115 = 104 watts)

*Typical Power Usage Chart*

<b>Typical Appliance</b>	<b>Typical Appliance current Draw</b>
Cellular phone charger	20 watts
Camcorder	30 watts
VCR	45 watts
Soldering iron	45 watts
Laptop computer	70 watts
13" TV	70 watts
19" TV	95 watts
100 watt work light	100 watts
Small stereo system	120 watts
3/8" drill	500 watts
Small microwave oven	1,100 watts
Hair dryer	1,200 watts
Large microwave oven	1,700 watts
Circular saw	1,800 watts

Some products draw a high surge current to start up. If the appliance does not operate and the inverter turns off, you may need a larger inverter. Also, check that the 12 volt wiring to the inverter is large enough to handle the current draw and that the battery is fully charged.

**IMPORTANT:** The smaller power inverters may not operate some appliances designed to produce heat such as hair dryers, heaters, toasters and coffee makers. Always check the power rating before using these kinds of products to be sure they do not exceed the power capability of the inverter.

### **Battery Life**

Important: The power inverter can draw lots of amps from your car's battery when operating. If you are using it for extended periods of time, you will want to operate your car occasionally to maintain

the charge in your car's battery. In addition, the power inverter will also draw a small current, less than 0.1 amp, when turned off and not operating. Therefore, it should be disconnected from your car's battery if your vehicle will not be used for more than a day. The following chart shows typical operation time for two typical car batteries with the engine not running for various loads. Check the size of your battery.

*Battery Life Chart*

<b>Power Usage</b>	<b>Approximate 12v Current</b>	<b>Typical operation time with 50 amp-hour car battery</b>	<b>Typical operation time with 100 amp-hour car battery</b>
100 watt	9 Amps	5.5 hours	11 hours
200 watt	19 Amps	2.6 hours	5.2 hours
500 watt	47 Amps	1 hour	2 hours
1,000 watt	94 Amps	30 minutes	1 hour
1,500 watt	140 Amps	20 minutes	40 minutes
2,500 watt	235 Amps	12 minutes	24 minutes

### **Actual Current Draw**

Approximate 12 volt current draw is the load in watts divided by 10. Therefore, a 60 watt light bulb plugged into the inverter will cause the inverter to draw 6 amps ( $60 / 10 = 6$ ) from the 12 volt supply.

Batteries are rated in several different ways:

Peak cranking amps - This has little to do with how long an inverter can supply power, so it is not a useful number for inverter operation.

Battery reserve capacity - This number shows how long a battery can supply a given current, typically 25 amps, before the battery voltage reaches a low voltage. Therefore a battery rated at 200 minutes reserve can deliver 25 amps for 200 minutes before it is discharged.

Ampere-hour capacity - This rating indicates how many amps a battery can deliver over a period of time, typically 20 hours. Therefore a 100 amp-hour battery can deliver 5 amps for 20 hours ( $5 \times 20 = 100$ ).

Actual operating time from a battery will depend upon the current draw from the battery. A battery will deliver less total power (energy) as you draw higher amps. A 100 amp-hour battery can deliver 5 amps for 20 hours (100 amp-hours), but it will only deliver 50 amps for 1 ½ hours ( $50 \times 1.5 = 75$ ) or 75 amp-hours at the higher rate.

Also remember, battery life is decreased if the battery is discharged fully. Lead-acid batteries have the longest life, if they are kept fully charged.

### **Lights and Alarms**

#### **VOLTS Meter**

This 10 segment LED meter shows the actual 12 VOLT input voltage when the inverter is turned on. Each segment represents ½ of a volt starting at 10 VOLTS up to 15 VOLTS.

### **Under Voltage Mode**

The amber segments will light and the power inverter will begin to beep if the battery voltage drops below about 10.5 volts. When the voltage reaches about 10 volts, the power inverter will shut off protecting your battery from being completely discharged. Note, it is normal for the unit to emit a short beep when first connected to the power source.

### **Over Voltage Mode**

The amber segments will light if the battery voltage goes up to about 14.5 volts. When the voltage reaches about 15 volts, the red segment will light and the power inverter will shut off protecting the inverter from damage. The unit will automatically reset in about 3 seconds when the voltage drops into a safe range.

### **Current (AMPS) Meter**

This 10 segment current LED meter shows the actual 12 volt input current in amps that the inverter is drawing. The current range varies with the model. As long as the green segments are lit, it is in the normal range. The inverter should not be operated for any length of time when the amber segments come on. The unit will turn off in a few seconds if the red segment lights indicating a excessive current draw. *Note:* it is normal not to have any segment lit on the meter when either no load or a very light load is operated.

### **OVER TEMP Fault Indicator (red)**

The OVER TEMP light will light and the power inverter will turn the output off, and start beeping once the unit's temperature limit is reached. The fan will remain on so the unit cools as quick as possible. Remove the load from the unit and wait until the inverter cools down, typically 30 seconds to several minutes depending upon the ambient temperature and overload conditions. When the unit is cool enough, the inverter will automatically start back up.

### **OVER LOAD Fault Indicator (red)**

The OVERLOAD light will light and the power inverter will turn off to protect itself from excessive load conditions. The fan and voltage meter will also turn off. To reset the fault, remove the overload condition, then turn the inverter off and back on. It should now be operational again.

### **Fuse Replacement**

If you overload the power inverter, it is possible that the external fuse might blow. Always determine the cause of the fuse blowing and remedy the problem before using the power inverter again.

## How the Inverter Works

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The Sima power inverter has two electronic sections. The first section converts 12 volts DC to approximately 160 volts DC using modern high frequency conversion techniques that uses small lightweight efficient transformers. The second section converts the 160 volts DC to 115 VAC using high efficiency power MOSFET transistor devices. The inverters generate a modified sine wave that works with almost every product on the market.

**CAUTION:** Do not use the following products with an inverter with a modified sine wave output.

- Small battery operated devices like razors, flashlights and night lights that can be plugged directly into an AC outlet to recharge
- A few battery chargers for power tool battery packs that have warnings about high voltage present on the battery terminals.

## Troubleshooting

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Problem	Cause	Solution
Unit does not operate	Input voltage is below 11 volts	Attach to proper supply. Charge batteries.
	Fuse blown	Determine cause for fuse blowing and then replace fuse feeding inverter.
Fan does not run but unit operates	Normal when unit is cool	
Unit operates for a short period and then turns off	Load is trying to draw too much current	Be sure load is less than rated watts of inverter. Remove excessive load. Turn inverter off and back on to reset.
Unit operates for a while and gets hot	Inverter is in thermal shutdown mode	Allow inverter to cool down and it will reset automatically.
VOLTS meter indicates 10.5 volts and alarm is on	Input voltage is below 10.5 volts	Make sure car engine is running. Check condition of wiring. Battery may be low and needs recharging.
Television and stereo interference	RF interference from power inverter	Position the power inverter and wiring as far as possible from electronic equipment, antenna and cables and reorient as necessary.
115 VAC Output voltage reads incorrectly	Modified sine wave output can cause incorrect reading on a typical multimeter	Use a true RMS meter like a Fluke 8060A or Triplet 4200 to measure correct voltage.

*Light Status Chart*

<b>Power Switch</b>	<b>Voltage Meter</b>	<b>OVER TEMP Light</b>	<b>OVER LOAD Light</b>	<b>Beeper</b>	<b>Fan*</b>	<b>Mode</b>
Off	Off	Off	Off	Off	Off	Unit is off
On	11 to 13 volts	Off	Off	Off	On*	Normal Operation
On	Greater than 14.5 volts	Off	Off	On	On*	High input voltage, above 14 volts
On	10 to 10.5 volts	Off	Off	On	On*	Low input voltage, 10.5 to 10.0 volts
On	Less than 10.5 volts	Off	Off	On	On*	Low input voltage, less than 10 volts
On	Off	On	Off	On	On	Unit over temperature
On	Off	Off	On	Off	Off	Unit overloaded
On	Off	Off	Off	Off	Off	No 12 VOLT input to inverter

\* Note: Fan operates once the unit is warm



## Product Specifications

KEY FEATURES	SPV-8	SPV-10	SPV-15	SPV-25
<b>Input</b>	12 - 14 volts DC	12 - 14 volts DC	12 - 14 volts DC	12 - 14 volts DC
<b>Input no-load current</b>	< 0.55 A	< 0.6 A	< 0.6 A	< 0.95 A
<b>Output type</b>	modified sine wave	modified sine wave	modified sine wave	modified sine wave
<b>Output, Watts,</b>				
<b>20 minutes</b>	800W	1,000W	1,500W	2,500W
<b>continuous</b>	650W	800W	1,200W	2,000W
<b>10 minutes</b>	900W	1,100W	1,650W	2,750W
<b>Output, peak</b>	1,600W	2,000W	3,000W	5,000W
<b>Frequency, +/- 1%</b>	60 Hz	60 Hz	60 Hz	60 Hz
<b>Outlets</b>	2	2	2	4
<b>Volt meter</b>	yes	yes	yes	yes
<b>Current meter</b>	yes	yes	yes	yes
<b>Remote turn on capability</b>	yes	yes	yes	yes
<b>Protection</b>				
<b>Thermal</b>	yes	yes	yes	yes
<b>Low battery alarm</b>	yes, 10.5v	yes, 10.5v	yes, 10.5v	yes, 10.5v
<b>Low battery shutdown</b>	yes, 10v	yes, 10v	yes, 10v	yes, 10v
<b>Output short circuit</b>	yes	yes	yes	yes
<b>Size (inches)</b>	3" x 10" x 13"	3" x 10" x 15"	3" x 10" x 17"	6.5" x 9.5" x 19"
<b>Weight: unit/gross</b>	6.2 / 10 lb	7.1 / 11 lb	8.6 / 12 lb	20 / 24 lb
<b>Package Includes:</b>				
<b>User Manual</b>	yes	yes	yes	yes
<b>Alligator cables</b>	yes (5')	yes (5')	yes (5')	no

## 90 Day Limited Warranty

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Sima Products Corp. ("Company") warrants that if the accompanying product proves to be defective to the original purchaser in material or workmanship within 90 days from the original retail purchase, the Company will, at the Company's option, either repair or replace same without charge (but no cash refund will be made).

What you must do to enforce Warranty

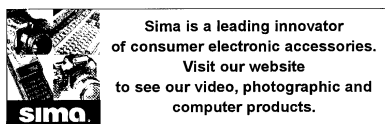
You must deliver, mail or ship the product, together with the original bill of sale, this limited Warranty statement as proof of warranty coverage to:

Sima Products Corp., Attn: Customer Service  
140 Pennsylvania Ave., Bldg. #5, Oakmont, PA 15139  
412-828-3700

It is recommended that you call Sima at the number listed above to obtain a return authorization number.

### Limitation of Liability and Remedies

Sima shall have no liability for any damages due to lost profits, loss of use or anticipated benefits, or other incidental, consequential, special or punitive damages arising from the use of, or the inability to use, this product, whether arising out of contract, negligence, tort or under any warranty, even if Sima has been advised of the possibility of such damages. Sima's liability for damages in no event shall exceed the amount paid for this product. Sima neither assumes nor authorizes anyone to assume for it any other liabilities.



# **sima**

Sima Products Corp.  
140 Pennsylvania Ave., Bldg. #5  
Oakmont, PA 15139 USA  
412-828-3700 • 800-345-7462  
412-828-3775 FAX  
Visit us at [www.simacorp.com](http://www.simacorp.com)  
E-mail us at [custserv@simacorp.com](mailto:custserv@simacorp.com)

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